micro-organisms, and especially the bacillus of tuberculosis. They report that they have found nothing of a harmful character, and have arrived at the conclusion that the danger of spreading infection by means of circulating libraries is very slight. They recommend, however, that books should be well dusted before being read, and that the fingers should not be wet in the mouth in order to turn the leaves. If the experiment is correctly reported, the authorities of Dresden are not justified in deducing any such inferences. The material which may accumulate in the form of dust on "unused books," and that which may collect on books in infected rooms, are of a totally different character. To determine the danger from the use of these latter books, another series of experiments must be made, and, in the present state of our knowledge as to the germs of infectious diseases, not much could be expected even from such experiments. The germs of measles, scarlet-fever, and small-pox, which diseases are known to be propagated by articles of wearing-apparel which have been exposed in infected rooms, have never been recognized, and the search for them in the dust which has collected on books would doubtless be as futile as it has been elsewhere; but there is no *a priori* reason why such books might not be carriers of contagion equally with clothing and furniture. The advice given to dust books well before reading them, in order to avoid danger, is, if the Dresden authorities are correct in saying that such dust is harmless, entirely unnecessary, while, if the dust should be infected, it would be the best possible way to spread the infection. Books which have been in an infected room, especially if they have been opened, should be destroyed. It is practically impossible to disinfect them.

THE LOCO-WEED. — Readers of *Science* have from time to time written us regarding the "loco-weed" and its poisonous properties, and we have recorded every thing which could be learned about its effects on animals and men. In Vol. IX. p. 32, we referred to a curious affection which exists among horses in north-western Texas, known as "grass-staggers," which is caused by eating the "loco-weed," which gives rise to the saying that the horses are "locoed." The Indians believe that an insect is the cause of the disease, but competent investigators have failed to find any insect life upon the plant. In Idaho the same disease is found, and is treated by amputation of the tails of the affected animals (*Science*, ix. p. 306). Francis H. Snow of Lawrence, Kan. (*Science*, ix. p. 92), refers to observations which tend to support the idea that insects are connected with the causation of the disease. Professor Sayre of the University of Kansas was said to be making an exhaustive study of the "loco" problem. Dr. Mary Gage Day of Wichita, Kan., has recently made a number of experiments upon healthy cats to test the toxic qualities of the weed, and has communicated the results to the New York *Medical Journal*. The "loco-weed" is a popular name given to *Astragalus mollissimus* and *Oxytropis Lamberti*. In the experiments of Dr. Day, a decoction of the roots, leaves, and stems of plants gathered in September was used. The result of feeding the decoction to a kitten was to produce diarrhœa, vomiting, convulsions, paralysis, and, at the end of twenty days, death. After death, ulcers were found in the stomach and intestine. In another experiment with a more concentrated decoction, on a full-grown cat, the symptoms were much the same, the cat dying on the thirteenth day. Professor Vaughan of the University of Michigan made experiments on frogs and kittens, injecting the decoction under the skin, producing death. With reference to the character of the plants at different seasons of the year, Dr. Day is convinced, by numerous experiments on material gathered in different months, that the greatest amount of poison is present in the autumn and winter, after the seeds have ripened, and that the explanation of the ranchmen, that the "loco" disease is more prevalent in the autumn and winter because the animals eat more of the weed from the scarcity of other food, is only a partial explanation. The greater toxicity of the plants at that season she believes to be a very important element. From the facts and experiments detailed, the following conclusions are drawn: 1. There is some poison in "loco-weed" which may cause the illness, and, if sufficient quantity is taken, the death, of an animal. 2. This poison is contained in the decoction obtained from the plants, and, by systematically feeding it to healthy cats, cases of "loco" disease may be produced. 3. From the large quantity of the plant or the decoction required to produce the disease, the poison must be weak, or, if strong, it must be in very small amount.

SCIENTIFIC NEWS IN WASHINGTON.

Effect of Permanent Moisture on Certain Forest-Trees.[1]

IN 1874, while engaged in the work of the Kentucky Geological Survey in the lowland district near the Mississippi, I had an opportunity of making some inquiries concerning the knees of the swamp cypress, which led me to the supposition that these peculiar processes from the roots served in some manner to aerate the sap. Their functional importance was indicated by the fact that whenever their summits were covered by water, as by the sinking of the ground on which they stood in the earthquake of 1811, or by the artificial elevation of the water during the summer season in mill-ponds, the trees to which they belonged inevitably died. On the other hand, the trees which grew upon high ground failed to develop any knee processes beyond slight tuberosities on the upper side of their main roots. The results of this and other inquiries were put in press about twelve years ago, but were first published in Vol. XVI. No. 1, of the "Memoirs of the Museum of Comparative Zoölogy at Harvard College," June, 1887. An incidental reference to the fact was made in the third volume of the reports of progress of the Kentucky Geological Survey (1877), p. 74.

Since that time I have incidentally observed certain other phenomena connected with the conditions of our forest-trees in swamps, which, so far as my knowledge goes, have not received adequate attention. I have hoped to find an opportunity to make a more careful inquiry into the subject, but this does not seem possible. I therefore venture to give the results of the very incomplete investigation in this letter.

As it seemed unlikely that the cypress should be the only tree to develop root processes intended to fit the plant for semi-aquatic life, I searched for similar excrescences on the roots of our other forest-trees which find their station in wet lands. Until within a few months, I have been unable to find any other species in which the processes were sufficiently developed to be classed in importance with the cypress knees. A very little inquiry showed me that all trees which find a station in very wet lands have their large roots nearer the surface of the soil than in the upland districts, and several species exhibit a tendency to have their roots at certain points actually on or above the soil. Observations in the Mississippi swamps seem to show that our ordinary tupelo or sour gum (*Nyssa uniflora*, Walt.) exhibited rather more of this tendency than any other species, and I suspected that under favorable circumstances it might show a peculiar adaptation to its swampy surroundings. Observations in the Mississippi valley were difficult, for the reason that the pools beneath which the roots of the trees extend dry out during the summer droughts. Recently, however, in the Dismal Swamp district of Virginia and North Carolina, I found many areas occupied by the tupelo which did not become desiccated in the dry seasons. In all such positions, the tree, when of mature growth, has a peculiar feature in its roots which serves in an admirable way to accomplish the results attained by the cypress knees, though the method by which it is attained is peculiar. In place of forming a spur-like process upon the root, the root itself arches upward in such a manner that the upper part of the bow rises above the level of the water in the growing season. Where the depth of water is slight, the arch may be indistinctly developed. Where the water stands a foot or more in depth, the arch becomes very much elevated. I found specimens in which the roots assumed a horseshoe-like curve, rising to the altitude of three feet above the soil, the distance apart of the roots at their base not exceeding a foot. These roots commonly have a diameter of from three to six inches. The fact that they rise above the level of the water in the growing season is often attested by a considerable growth of annual plants which have become planted in the crevices of the bark.

These roots of the *Nyssa* do not appear to develop their arches until the tree attains a considerable size. I found no trace of them

[1] Preliminary notice of some results of the United States Geological Survey examination of swamp-lands, by N. S. Shaler.

in the cases where the plant was less than one foot in diameter at the ground, and they do not become a conspicuous feature until the tree is nearly adult; i.e., until it has attained a diameter of eighteen inches or more. At this stage of growth, if the crown be permanently wet, the knees become an extremely conspicuous feature, fifteen or twenty often being found grouped about a single stem at the distance of from five to twenty feet from the base of the bole. It thus appears tolerably certain that the need of having a portion of the roots above the water-level will be found in certain other trees. Thus far my note-books supply me, however, no certain indications of this fact. Indeed, it is only in the case of *Taxodium* and the tupelo that I have found the plants under circumstances which would show clearly their needs in this respect.

There is another feature concerning the growth of water-loving trees, or at least those which are tolerant of permanent moisture, that deserves attention. I have reference to the form of the bole or trunk as it is exhibited in the specimens of the Southern species, which occupy situations diversely affected by moisture. On very wet ground the trunk appears to be generally expanded at the crown, in a measure, which is not the case in specimens of the same species growing in dryer situations. Thus, in the cypress, we not infrequently find the bole at the crown, and for some feet above, having a diameter twice as great as it is at ten feet above the surface. Where, however, the tree grows on a dryer soil, the expansion at the base is much less considerable. The same appears to be the case in the tupelo, which often has a remarkable expansion of the trunk near the surface of the ground, where the plant occupies very wet situations. In a somewhat less degree, this feature appears to exist in all our trees, except the willows, which occupy sites characterized by diversity in the measure of wetness. I should state that this opinion rests entirely on eye-measurements. I have long intended to submit the impression to the criticism of a careful determination, but have not been enabled to do so. The impression has, however, been so often repeated to me in different regions, that I am inclined to believe there is little chance of error in the statement. I trust that some one who is well placed for such observations will subject the suggestion to a careful statistical inquiry.

If I be correct in the opinion that trees in very wet situations develop an enlarged bole near the surface of the ground more frequently than those which occupy dryer situations, we may perhaps account for the fact in the same way in which I am disposed to explain the occurrence of knees in *Taxodium* and of root-loops in the tupelo; viz., through a need of an aeration of the sap, which is denied in roots that are under water.

It appears to me from eye-observation, as yet uncorrected by measurements, that the buttresses which the water-loving trees form about the trunk are more considerable than they are in the same species on higher land. If this be really the case, it may perhaps be due to the same physiological need which has led to the formation of knees, and to the enlargement of the bole near the crown of the tree. I feel less confident as to this increase in the buttress prominences than I do concerning another observation which I have above set forth. I state the impression for the reason that it has very frequently been borne in upon me in my studies on the development of swamp-plants. At first I was disposed to attribute the peculiarity to the fact that the roots of swamp-trees do not usually extend far beneath the surface, and therefore the buttresses were enlarged in order to give greater stability to the trunk. This hypothesis was disproved by the fact that trees growing in such situations are very rarely uprooted by storms. I failed, indeed, to find a single case of such uprooting by the action of the wind in several thousand miles of journeys through the morasses in the eastern part of the United States. The only cases in which such overturning met my eye appeared in the swamps near the Mississippi, which, on the whole, exhibit buttress structures much less conspicuously than the trees of the Atlantic coast morasses.

There is another interesting series of facts connected with the effect of excessive water on our forest-trees which are tolerant of swamp conditions. These relate to the variations in the character of the bark, the mode of branching, etc., of the plants in situations diversely conditioned as regards the amount of moisture. In almost all our forest-trees, which range from dry to very wet stations, there are noticeable diversities as regards the above-mentioned features, according to the station they occupy. Thus the ordinary chestnut oak varies in a very noticeable manner between dry ground and wet. The tree in very wet situations has a much smoother bark than it exhibits on high land, and I am told by the woodmen that this bark in trees which grow within the swamp is unfit for the purposes of tanning. The variety of tupelo known to the woodman of the Dismal Swamp as the "pawpaw gum," appears to owe its peculiarities to the fact that it normally grows in much wetter localities than the ordinary *Nyssa*. It differs from the parent species in that the bole is singularly enlarged near the crown, often having a diameter for some feet above the surface of the water two and one half times as great as it has at the height of ten feet above the ground. In this connection it may be noted that this variety of the tupelo is less disposed to develop the root-loops than the more common form, it appearing indeed as if the great extension of the bole near the crown made the development of these processes unnecessary.

The variation in the character of our forest-trees when exposed to swamp conditions affords an extremely interesting field for an important class of inquiries concerning the influence of environment, and the effect of natural selection, on the development of organic forms. In the Dismal Swamp, where the water-level during the growing season is subject to relatively little variation, a difference in altitude of six inches, or at most a foot, will greatly affect the character of the timber-trees and other plants. With each such variation in height, we perceive a noteworthy change in the character of the vegetation.

MENTAL SCIENCE.

Statistics of Visual Images.

THE American Society for Psychical Research has devoted considerable time to the study of unconscious mental habits, — a field that abounds in suggestions applicable to the class of phenomena which such a society investigates, but is still more valuable as contributing to our knowledge of obscure mental traits. Thus Professor C. S. Minot has shown that we are by no means as likely to think of one number as of any other, when simply asked to think of a number, but that there exist certain definite and very general preferences for certain numbers above others. People have "number-habits," or unconscious tendencies to choose a certain few numbers (perhaps on account of greater familiarity, easy manipulation, peculiar association, brevity of utterance, or other causes) when an unlimited choice is offered them. In No. 4 of the "Proceedings of the American Society for Psychical Research," Professor Minot brings together extremely interesting material for a similar study with reference to the "diagram-habit." The committee on experimental psychology of this society sent out a large number of postal-cards bearing the printed request, "Please draw ten diagrams on this card, without receiving any suggestion from any other person, and add your name and address." Five hundred and one such cards have been collected, of which 310 were drawn by men, 169 by women, and 22 had no name.

The first point of interest in such a study is to observe how various the drawings of five hundred persons will be. We are not told how many different designs occurred; but the occurrences of 83 different designs have been tabulated, and their sum includes about half of all the drawings. But the real poverty of the intellect when it expresses itself naturally is made evident by the great preponderance of a very few simple diagrams. Thus circles were drawn 209 times; squares, 174 times; equilateral triangles, 160 times; crosses, 160 times; letters of the alphabet, 82 times; diamonds, 80 times; oblongs (horizontal), 78 times; inscribed circles, 78 times; stars, 77 times; faces (profile to the left), 61 times; houses, 56 times; rhombi, 56 times; scrawls, 53 times; other animals and heads, 48 times; flowers, 46 times; leaves, 45 times; hexagons, 42 times; cubes, 42 times; right-angled triangles, 42 times; figures of men, 32 times; and so on. The above are the twenty most frequent drawings, and, it will be seen, form an aggregate amounting to nearly one-third of all the drawings. On the average, each occurs 80 times. If we group to-